dempe_dutta_3_4

This second example from Dempe and Dutta's 2012 paper [1, Example 3.4] shows that in the case of multiple Lagrange multipliers and when the constant rank constraint qualification is not satisfied, the KKT-reformulation will have solutions that do not correspond to bilevel solutions. In particular, this Bilevel program has a unique minimum at $(0.5, 0.5)$. However, its corresponding KKT-reformulation has multiple minima, including one at $(0, 1)$, which is not the solution to the bilevel.

$$\begin{array}{ll} \underset{x,\ y^*}{\text{minimise}} & (x-1)^2 + (y^*-1)^2 \\ \text{subject to} & y^* \in \underset{y}{\arg\min} \left\{ \begin{array}{lr} -y : & \\ \text{s.t.} & x + y \leq 1 \\ & -x + y \leq 1 \end{array} \right. \end{array}$$

			Dimension	Type
Upper-level	x	variables	1	real
	F(x,y)	objective	1	quadratic
	G(x,y)	inequality	0	none
	H(x,y)	equality	0	none
Lower-level	y	variables	1	real
	f(x,y)	objective	1	linear
	g(x,y)	inequality	2	linear
	h(x,y)	equality	0	none

References

[1] Stephan Dempe and Joydeep Dutta. Is bilevel programming a special case of a mathematical program with complementarity constraints? *Mathematical Programming*, 131:37–48, 2012.